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(21) International Application Number: PCT/GB91/01104 (22) International Filing Date: 5 July 1991 (05.07.91) (30) Priority data: 9016619.0 28 July 1990 (28.07.90) GB (71) Applicant (for all designated States except US): SCAPA GROUP PLC [GB/GB]; 52 Preston New Road, Blackburn, Lancashire BB2 6AH (GB). (72) Inventors; and (75) Inventors/Applicants (for US only) : JEFFERY, John [GB/GB]; 65 Royshaw Avenue, Pleckgate Park, Pleckgate, Blackburn, Lancashire BD1 8RJ (GB). KANIUKA, Leslie, Yaroslaw [GB/GB]; 29 Ashworth Lane, Bolton, Lancashire BL1 8RD (GB). SAYERS, Ian, Christison [GB/GB]; 30 Chesterbrook, Ribchester, Near Preston, Lancashire PR3 3XT (GB).		(74) Agents: FUNGE, Harry et al.; M'Caw & Co., 41-51 Royal Exchange, Cross Street, Manchester M2 7BD (GB). (81) Designated States: AT (European patent), AU, BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB, GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), US. Published <i>With international search report.</i>
(54) Title: ENDLESS BELT FOR EXTENDED NIP DEWATERING PRESSES <div> </div>		
(57) Abstract <p>An endless belt for an extended nip press is disclosed which comprises an apertured membrane (11) having a coating layer (12, 13) of a matrix material at one or both sides thereof, the membrane including reinforcing yarns (14), extending at least in the intended running direction of the belt and the belt preferably having a ribbed or profiled surface at that side thereof remote from the shoe. Reinforcing yarns may also exist in the intended cross-machine direction of the belt and further profiled reinforcing yarns may be provided within the membrane to extend outwardly therefrom in register with longitudinally extending ribs existing at the felt side of the belt.</p>		

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⁺ It is not yet known for which States of the former Soviet Union any designation of the Soviet Union has effect.

- 1 -

ENDLESS BELT FOR EXTENDED NIP DEWATERING PRESSES

The invention concerns improvements in or relating to extended nip dewatering presses and has more particular reference to a belt for use in the context of such presses.

In the press section of a papermaking machine or the like the paper web, interposed between two moisture-absorbing felts, moves in pressure contact with a press roll, being urged into such contact by a pressure shoe acting through a belt in contact with the outermost, in relation to the press roll, of the moisture absorbing felts.

The pressures applied by the shoe and the need to maximise removal of water from the paper web impose limitations on belt design, and the primary object of the present invention is to provide a belt for an extended nip press which will be capable of withstanding the pressures to which it will be subjected in use without substantial prejudice to the water conveying capabilities thereof.

The object of the invention is to provide an alternative belt for an extended nip dewatering press to that disclosed in our United Kingdom Patent Application No. 2221702.

According to the present invention there is proposed an extended nip press belt for the press-section of a papermaking machine or the like, the belt comprising an apertured membrane and an impermeable coating at at least one face thereof, the material of the coating layer engaging the apertures in the said membrane and extending at least to the

- 2 -

plane of the face of the membrane opposite the said at least one face, the membrane including reinforcing yarns in the running direction of the belt.

According to a preferred feature, the material of the coating layer extends through the apertures in the membrane beyond the plane of the face of the membrane opposite the said at least one face.

According to a further preferred feature, the material of the coating layer extends through the apertures in the membrane to form discrete protuberances at the said opposite face, each said protuberance corresponding to a respective aperture in the membrane and the protuberances collectively defining a regularly profiled surface to the belt.

According to another feature of the invention, a coating layer is provided at each face of the membrane, the coating layers being in mutual contact through the membrane and being in fused relationship one with the other.

According to yet another feature of the invention the belt is of endless form and includes an apertured membrane piece having reinforcing yarns therein spanning abutting ends of an open-ended belt.

The invention will now be described further, by way of example only, with reference to the accompanying diagrammatic drawings in which:-

Fig. 1 is a perspective view, partly cut away, showing a first embodiment of the invention;

- 3 -

Fig. 2 is a section on line II-II of Fig. 1, drawn to a larger scale;

Fig. 3 is a view corresponding to Fig. 1 and shows a second embodiment of the invention;

Fig. 4 is a section taken on line IV-IV of the embodiment shown in Fig. 3;

Fig. 5 is a view corresponding to Fig. 2 and shows a modified form of the embodiment shown therein;

Fig. 6 illustrates one manner in which the ends of the embodiment of Figs. 1 and 2 may be joined together to form an endless belt; and

Fig. 7 is a view corresponding to Fig. 6 and shows an alternative way in which fabric ends may be joined.

Referring now to the drawings, and in particular to Figs. 1 and 2 thereof, an ENP belt comprises an apertured membrane 11 provided with facing layers 12, 13 of a thermoset polyurethane material.

Membrane 11 is produced in accordance with the method disclosed in United Kingdom Patent Specification No.2202873 and includes reinforcing yarns 14, for example of polyester or polyamide monofilament or multifilament material extending in the running direction of the belt, the reinforcing yarns being positioned in the lands 15 existing between adjacent apertures 16. The apertures 16 are conveniently 1mm square, the lands suitably being of the same width, and have a slight taper, the membrane being 1mm thick.

Of the facing layers 12, 13, layer 12, being the

- 4 -

layer at that side of the belt intended for contact with the shoe, has a smooth surface and can be of a softer polyurethane material than layer 13, thereby to minimise the creation of an oil mist in moving over the shoe.

Facing layer 13 presents ribs 17 for engagement with the press felt.

The polyurethane material which forms facing layers 12, 13 is an isocyanate/polyol system and is applied to the membrane by means of a spraying technique, the material of one or both of such layers passing into the apertures 16 to form a mechanical bond with the membrane. However, alternatives to the isocyanate/polyol system may be used for example an isocyanate/polyurea system is believed to be of application to the context of the invention. Furthermore, instead of spraying, a cast system or a knife over roller coating technique may be employed, such systems reducing the incidence of air bubbles in the finished product.

In a second embodiment of the invention as shown in Figs. 3 and 4, a membrane 31 of similar form to that of the embodiment of Figs. 1 and 2 is provided with a facing layer 32 at one side only thereof, the material of facing layer 32 extending through the apertures 33 to form protuberances 34 at the opposite side of the membrane 31 which stand proud of the corresponding plane of said membrane to define a profiled surface configuration or comparable surface effect to the ribs 17 as shown in Fig. 1.

The planar membrane shown in Figs. 1 and 2 and in

- 5 -

Figs. 3 and 4 includes reinforcing yarns 14 (Fig. 2) extending in the running direction of the belt. If desired, further yarns (not shown) may be provided within those lands which extend in the transverse direction of the membrane. The membrane may, however, also include additional reinforcement in the running direction, such additional reinforcement comprising yarns of T-shaped transverse cross-section arranged in inverted disposition with the limb thereof extending outwardly from the membrane.

Thus, referring now to Fig. 5, in a further embodiment, in addition to the longitudinally extending monofilament or multifilament polyester or polyamide yarns 51, the membrane 52 further includes additional reinforcement in the form of profiled yarns 53 of T-shaped transverse cross-section, the profiled yarns being arranged in inverted disposition with the limb 54 thereof extending outwardly from the lands 55 between adjacent apertures 56. As is apparent from the drawing, the profiled yarns 53 exist in register with the ribs 57 provided at the felt side of the belt and thereby provide a reinforcement for such ribs.

In the modification of the arrangement shown in Fig. 5, the longitudinally extending yarns 51 are omitted and reliance is placed on the reinforcement provided by the profiled yarns.

In order to provide an endless belt, the membrane may be brought into endless form before application of the facing layer or layers, a suitable manner in which joining of the

- 6 -

ends might be effected being disclosed in our copending United Kingdom Patent Application No. 2231838.

However, alternatives to the method disclosed in our copending application aforesaid do lend themselves to the context of coated belts of the kind herein proposed, and typical joints are shown in Figs. 6 and 7.

Thus, in the case of the arrangement shown in Fig. 6, each belt end 61 is slit along the plane of one face of the membrane 62 at each fabric end and the membrane is cut transversely of the belt in spaced disposition with respect of the belt extremity, the end of the membrane existing beyond the line of cut then being peeled off. The belt ends 61 are brought into abutment and are maintained in such disposition by engaging a membrane piece 63 having reinforcing yarns extending in the running direction of the belt with the multiplicity of upstanding lugs 64, each of such lugs having a configuration closely complementary to that of the apertures 65 in the membrane piece 63, the flaps 66 existing at the fabric ends then being laid flat on the membrane piece 63 and being secured thereto as by means of an adhesive and/or by the application of heat.

In a further alternative, see now Fig. 7, a short length of membrane (not shown) is applied to the surface of the coating layer 71 in the end region of the belt and whilst the coating layer is fluid, such membrane being peeled off when the material of the layer has hardened thereby to leave upstanding lugs 72.

- 7 -

The belt ends 73 are then brought into abutment and a jointing element 74 and the adjacent regions of the belt being heated to effect fusion between the jointing element and the material of the belt. If desired, any suitable adhesive may be applied to the mating faces of the regions to be joined.

It is to be appreciated that, if desired, a coupling agent/adhesion promoter may be utilised to enhance the bond between the membrane, whether it be the membrane used for joining together the fabric ends or otherwise, and the coating material, thereby to reduce the likelihood of delamination.

The invention is not restricted to the exact detail of the embodiments hereinbefore described, since alternatives will readily present themselves to one skilled in the art.

Thus, for example, the membrane may be of different dimensions from those herein set forth and may include reinforcing yarns of other than circular configuration.

Although in the foregoing embodiments the felt side of the belt has been described as having a ribbed or profiled surface, the invention is not limited to structures having such feature, and is equally applicable to ENP belts wherein both the shoe side and the fabric side are planar.

- 8 -

Claims

1. An extended nip press belt for the press-section of a papermaking machine or the like, the belt comprising an apertured membrane and an impermeable coating at at least one face thereof, the material of the coating layer engaging the apertures in the said membrane and extending at least to the plane of the face of the membrane opposite the said at least one face, the membrane including reinforcing yarns in the running direction of the belt.

2. A belt as claimed in claim 1, wherein the material of the coating layer extends through the apertures in the membrane beyond the plane of the face of the membrane opposite the said at least one face.

3. A belt as claimed in claim 2, wherein the material of the coating layer extends through the apertures in the membrane to form discrete protuberances at the said opposite face, each said protuberance corresponding to a respective aperture in the membrane and the protuberances collectively defining a regularly profiled surface to the belt.

4. A belt as claimed in any one of the preceding claims, wherein the membrane further includes reinforcing yarns extending in a direction transverse to the running direction of the belt.

5. A belt as claimed in claim 1 or 4, wherein a coating layer is provided at each face of the membrane, the coating layers being in mutual contact through the membrane and being in fused relationship one with the other.

- 9 -

6. A belt as claimed in claim 5, wherein the coating layer at the said at least one face is of a softer coating material than that present at the surface of the membrane opposite said one face.

7. A belt as claimed in claim 5 or 6, wherein the reinforcing yarns extending in the running direction of the belt comprise profiled yarns extending outwardly from the plane of the membrane and the belt includes ribs arranged in register with the said profiled yarns and within which said yarns are embedded.

8. A belt as claimed in claim 6, wherein said profiled yarns define further reinforcing yarns additional to yarns existing in and extending longitudinally of the membrane.

9. A belt as claimed in any one of the preceding claims wherein said belt is joined into endless form and includes an apertured membrane piece having reinforcing yarns therein extending in a direction corresponding to the running direction of the belt, the membrane piece spanning abutting ends of the said belt.

10. A belt as claimed in claim 9, wherein the membrane piece is positioned intermediate and spaced from the outer faces of the belt.

2 / 3

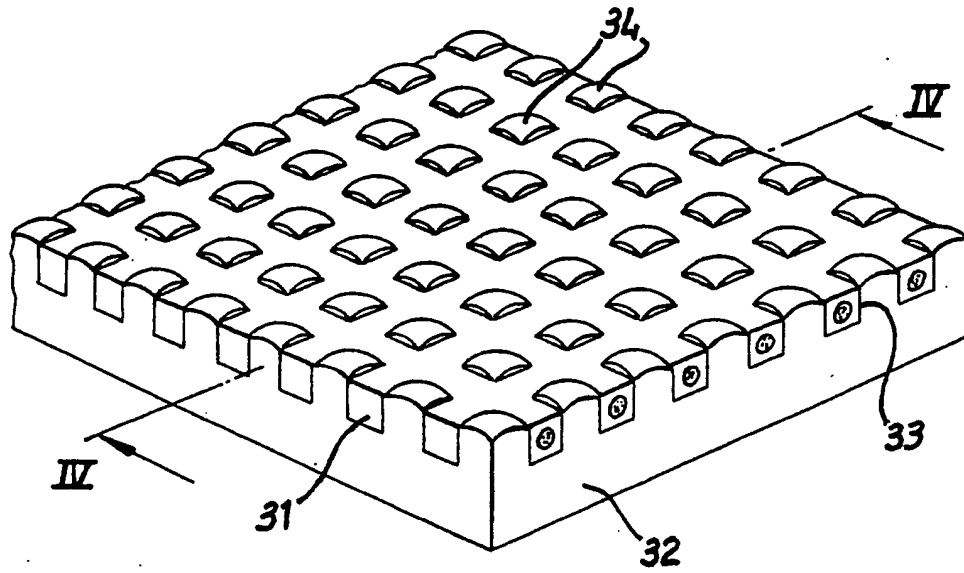


FIG. 3

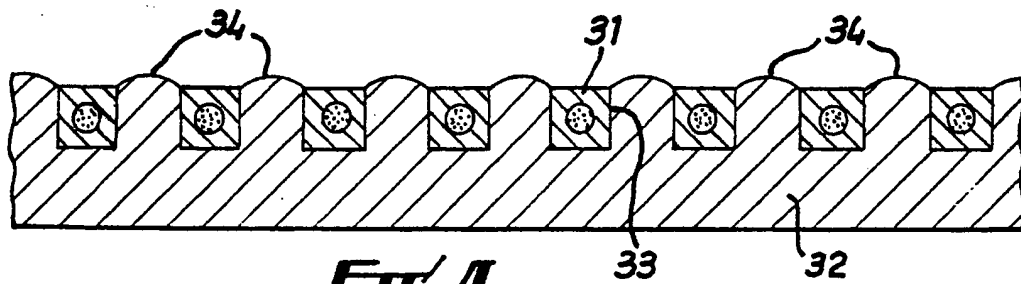


FIG. 4

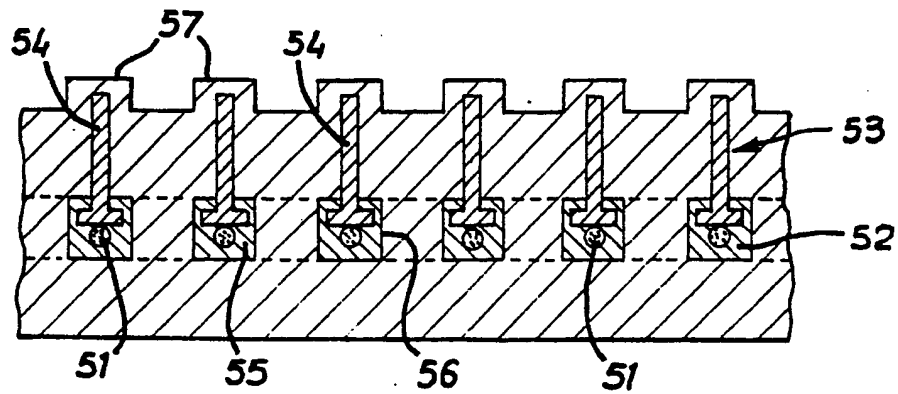
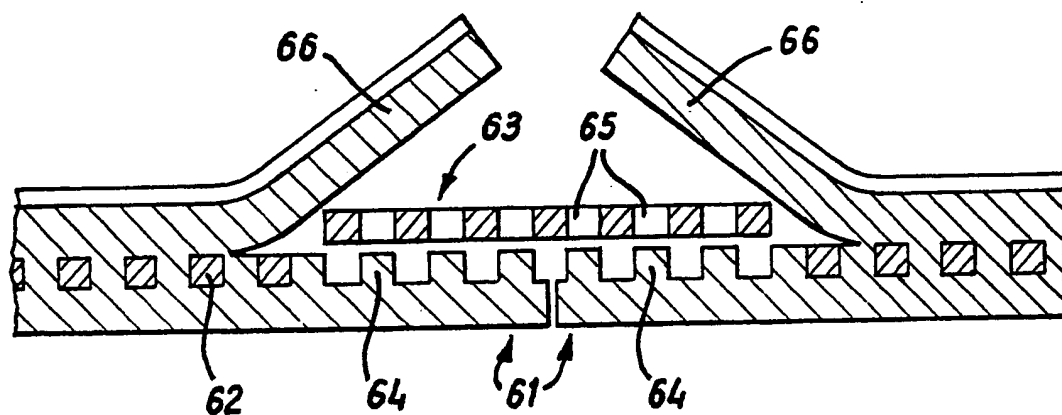
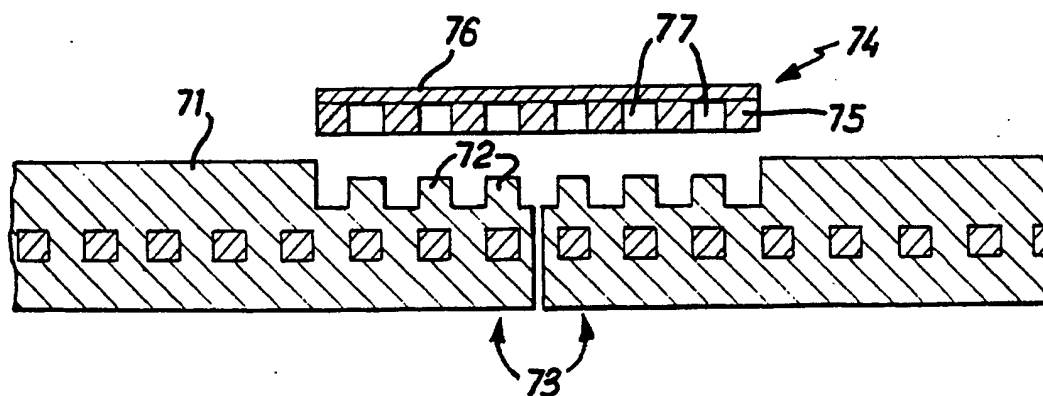


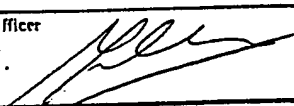
FIG. 5

**FIG. 6****FIG. 7**

INTERNATIONAL SEARCH REPORT

PCT/GB 91/01104

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁹		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 D21F3/02		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	D21F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US,A,3 617 442 (HURSCHEMAN) 2 November 1971 see the whole document ---	1,2,5
A	US,A,4 740 409 (LEFKOWITZ) 26 April 1988 cited in the application see the whole document ---	1,4
A	WO,A,8 605 219 (OY NOKIA AB) 12 September 1986 see the whole document ---	1,4
A	BE,A,674 961 (HUYCK) 11 July 1966 see the whole document ---	1
A	US,A,4 482 430 (MAJANIEMI) 13 November 1984 see the whole document ---	6
A	WO,A,8 702 080 (CRONIN ET AL) 9 April 1987 ---	
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IV. CERTIFICATION		
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18 NOVEMBER 1991	03. 12. 91	
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. GB 9101104
SA 49260**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-3617442	02-11-71	None	
US-A-4740409	26-04-88	AU-B- 607197	28-02-91
		AU-A- 1372388	29-09-88
		EP-A- 0285376	05-10-88
		GB-A, B 2202873	05-10-88
		GB-A- 2235705	13-03-91
		JP-A- 1020371	24-01-89
WO-A-8605219	12-09-86	AU-B- 575474	28-07-88
		AU-A- 5583086	24-09-86
		EP-A, B 0250421	07-01-88
		JP-T- 62502347	10-09-87
		SU-A- 1671164	15-08-91
BE-A-674961	11-07-66	None	
US-A-4482430	13-11-84	None	
WO-A-8702080	09-04-87	AU-B- 575216	21-07-88
		AU-A- 4961885	24-04-87
		EP-A, B 0239570	07-10-87
		US-A- 4978428	18-12-90
		US-A- 4908103	13-03-90